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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/692,403	10/23/2003	Zafir Abdo	2003P14606US	8501

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Siemens Corporation
Intellectual Property Department
170 Wood Avenue South
Iselin, NJ 08830

EXAMINER

BEVERIDGE, RACHEL E

ART UNIT	PAPER NUMBER
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1725

DATE MAILED: 05/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/692,403	Applicant(s) ABDO ET AL.	
	Examiner Rachel E. Beveridge	Art Unit 1725	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 October 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18, 25 and 26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18, 25 and 26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 April 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2,5, 10-18, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Burke et al. (US 6,325,871 B1).

Regarding claim 1, Burke discloses that the surfaces for transient liquid phase bonding can be cold worked (Column 11, lines 39-40) and specifies that the bonding material is similar to the base material but also contains a melting point depressing element that rapidly diffuses in the alloy (Column 6, lines 12-15). Furthermore, Burke discloses that “as the boron rich foil melts it wets the base material on either side of the bond and causes some dissolution of the base metal and a wider liquid zone” (Column 6, lines 23-25) and that “simultaneously solid state diffusion causes boron to be removed from the bond pool environs” (Column 6, lines 28-30). Burke discloses carefully controlling the chemistry of the bond medium and temperature of the bonding process to reproduce the chemistry and microstructure of the base material within the bond zone (Column 6, lines 34-38). Also, Burke states that the bonding temperature should be sufficient to melt the bond foil and a similar thickness of the base material “to produce a fine, well mixed bond zone” (Column 6, lines 43-45). Burke also states that

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there is isothermal re-solidification of the bond pool until the two solidification fronts meet near the center line of the bond (Column 6, lines 30-33). Furthermore, Burke discloses that the stresses created by the profiling techniques "must be sufficiently low such that they do not induce recrystallization from the deformed layer of cold work during subsequent thermal cycles, including bonding and heat treatment" (Column 11, lines 33-37); thus, satisfying applicant's claim that cold working must occurring to a degree less than that which would cause recrystallization of the substrate at or below the bond temperature. Burke also states that ground surfaces "do not contain sufficient stored plastic work to cause recrystallization in the near surface region. When these surfaces are heat treated, the surfaces do not recrystallize. Particularly, when the bonding material is melted over the worked surface, recrystallization is inhibited" (Column 12, lines 52-58).

With respect to claim 2, Burke's disclosure of figure 16 clearly shows two surfaces being joined together, and states the turbine blade comprises of two sections (12 and 14) and excess material (16 and 18) is provided at the interfacing surfaces (Column 15, lines 31-35). Furthermore, Burke discloses that sets of crystal and polycrystalline superalloys can be joined using foils and thermal cycles (Column 17, lines 45-49).

Regarding claim 5, the non-cold worked opposing surface can be viewed as the second side of a particular substrate. Therefore, a substrate having one side cold worked and the other side not cold worked can be bonded via transient liquid phase

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bonding of its cold worked side to another cold worked substrate according to Burke's disclosure of the bonding of cold worked surfaces in column 11, lines 39-40.

With regard to claim 10, Burke discloses a turbine blade comprising two sections (Fig. 16(12&14)) and excess material (Fig. 16(16&18)) is provided at the interfacing surfaces (Column 15, lines 31-35). Burke also discloses that bonding is "generally achieved by matching the bond foil chemistry to the base metal chemistry" (Column 18, lines 51-53) and that the bond foil is "similar to the base material but it also contains an extra addition of melting point depressing element" (Column 6, lines 12-15). Thus, any insert that is the same or similar composition as the substrate material should exhibit the same or similar grain structure as the base material. Burke discloses that the surfaces for transient liquid phase bonding can be cold worked (Column 11, lines 39-40) and states that there is isothermal re-solidification of the bond pool until the two solidification fronts meet near the center line of the bond (Column 6, lines 30-33). Furthermore, Burke discloses that the isothermal bonding process can be controlled to reproduce the chemistry and microstructure of the base material within the bond zone (Column 6, lines 34-38).

With respect to claim 11, Burke states that "as the boron rich foil melts it wets the base material on either side of the bond and causes some dissolution of the base metal and a wider liquid zone" (Column 6, lines 23-25) and that "the bonding temperature should be sufficient to melt the bond foil and a similar thickness of the base material to produce a fine, well mixed bond zone" (Column 6, lines 44-46).

With respect to claim 12, Burke discloses that the surfaces for transient liquid phase bonding can be cold worked (Column 11, lines 39-40) and specifies that the bonding material is similar to the base material but also contains a melting point depressing element that rapidly diffuses in the alloy (Column 6, lines 12-15). Furthermore, Burke discloses that "as the boron rich foil melts it wets the base material on either side of the bond and causes some dissolution of the base metal and a wider liquid zone" (Column 6, lines 23-25) and that "simultaneously solid state diffusion causes boron to be removed from the bond pool environs" (Column 6, lines 28-30). Burke also states that there is isothermal re-solidification of the bond pool until the two solidification fronts meet near the center line of the bond (Column 6, lines 30-33). Thus, the second material can be the bonding material, which will grow into the said substrate surface during the heating step of transient liquid phase bonding. Furthermore, Burke discloses that the stresses created by the profiling techniques "must be sufficiently low such that they do not induce recrystallization from the deformed layer of cold work during subsequent thermal cycles, including bonding and heat treatment" (Column 11, lines 33-37); thus, satisfying applicant's claim that cold working must occurring to a degree less than that which would cause recrystallization of the substrate at or below the bond temperature. Burke also states that ground surfaces "do not contain sufficient stored plastic work to cause recrystallization in the near surface region. When these surfaces are heat treated, the surfaces do not recrystallize. Particularly, when the bonding material is melted over the worked surface, recrystallization is inhibited" (Column 12, lines 52-58).

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Regarding claim 13, the second material comprising a second substrate with a surface is interpreted as being a foil or any other bonding material that is used in the transient liquid phase bonding process. Therefore, Burke's disclosures of the elements discussed in claim 12 above are applicable.

With respect to claim 14, it was interpreted that the first substrate and second material (defined as the second substrate by claim 13) were separate from each other and thus bonded via the steps disclosed in applicants claim 12. Therefore, Burke's disclosures of the elements discussed in claim 12 above are applicable

With regard to claim 15, Burke discloses that "as the boron rich foil melts it wets the base material on either side of the bond and causes some dissolution of the base metal and a wider liquid zone" (Column 6, lines 23-25) and that "simultaneously solid state diffusion causes boron to be removed from the bond pool environs" (Column 6, lines 28-30). Burke also states that there is isothermal re-solidification of the bond pool until the two solidification fronts meet near the center line of the bond (Column 6, lines 30-33).

With respect to claim 16, Burke discloses that sets of crystal and polycrystalline superalloys can be joined using foils and thermal cycles (Column 17, lines 45-49). Burke also discloses, "the bonding temperature should be sufficient to melt the bond foil and a similar thickness of the base material to produce a fine, well mixed bond zone" (Column 6, lines 44-46).

Regarding claim 17, Burke's disclosure of figure 16 clearly shows two surfaces being joined together, and states the turbine blade comprises of two sections (12 and

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14) and excess material (16 and 18) is provided at the interfacing surfaces (Column 15, lines 31-35). Furthermore, Burke discloses that sets of crystal and polycrystalline superalloys can be joined using foils and thermal cycles (Column 17, lines 45-49) and that "as the boron rich foil melts it wets the base material on either side of the bond and causes some dissolution of the base metal and a wider liquid zone" (Column 6, lines 23-25).

With respect to claim 18, it was interpreted that the substrate can be any material that can bond to the first substrate in the claimed manner; thus, rendering it possible for the insert to be labeled a substrate. Burke specifies that the bonding material is similar to the base material but also contains a melting point depressing element that rapidly diffuses in the alloy (Column 6, lines 12-15). Burke also discloses, "the bonding temperature should be sufficient to melt the bond foil and a similar thickness of the base material to produce a fine, well mixed bond zone" (Column 6, lines 44-46).

Furthermore, Burke discloses that "as the boron rich foil melts it wets the base material on either side of the bond and causes some dissolution of the base metal and a wider liquid zone" and that solid state diffusion simultaneously causes the boron to be removed from the bond pool environs and the two processes deplete the melting point depressant from the bond pool. Therefore, isothermal re-solidification of the bond pool occurs until the two solidification fronts meet near the center of the bond (Column 6, lines 23-33).

Regarding claim 25, Burke discloses rapid consumption of the cold worked layer in the presence of the bonding foil by the transient melting process and the

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resolidification process occurs as single crystal growth from the base material (Column 11, lines 60-63). Also, Burke states, "subsequent melting and solidification reproduces defect free single crystals" (Column 11, lines 65-66). This feature of Burke is also substantially similar to the disclosure by the applicant on specification page 7, line 7 and therefore satisfies the claim requirements. Furthermore, Burke utilizes base materials including IN-738 (see column 18, line 2 and tables 1 and 4 for examples of this property). Burke also discloses use of Ni-flex 115 and Ni-flex bonding materials (see column 18, line 20 and table 5 for evidence of this). Burke describes his process for airfoils in turbine blades utilizing the same materials as disclosed by the applicant and therefore it is inherent to arrive at the claimed limitation.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Burke et al. (US 6,325,871 B1) as applied to claim 2 above.

Burke does not specifically state that the process should be used for joining substrate surfaces that have been cold worked to a different degree. However, Burke

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does disclose particular stresses of cold working for desired re-crystallization after heat treatment (Column 11, lines 39-40; Column 11, lines 55-60; and Column 13, lines 51-54). Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify the substrates of Burke's transient liquid phase bonding process (if the surfaces are not already similar in chemical and microstructure) to have two surfaces cold worked to different degrees in order to produce the similar chemistry and microstructure in the bond zone that exists in the bulk of the substrate materials (Column 18, lines 48-51).

Claims 4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burke as applied to claim 1 above, and further in view of Stenard et al. (US 5,415,336).

Burke does not disclose a range of cold working stress to any one surface of a substrate. Stenard discloses shot peening the substrate surfaces before diffusion bonding. Stenard discloses a range of effective cold working time and rotation of the shot peening device as well as an approximate distance from the surface (Column 2, lines 34-38). Burke does not disclose shot peening the substrate surface within the range of 8-16 of the Almen scale. However, Stenard discloses the preferred parameters for the steel shot to be delivered at "a pressure of 50-80 psi (the resulting Almen intensity is near 10)" (Column 2, lines 27-30). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the process disclosed by Burke to have a surface with an uneven pattern of cold working stress in order to induce stress upon the surface without damaging the underlying layers of the

substrate making it difficult to proceed with diffusion bonding (Stenard et al., column 2, lines 17-21 and column 1, lines 52-54).

Claims 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burke et al. (US 6,325,871 B1) as applied to claim 1 above.

Burke does not specifically state that the substrate should be sufficiently cold worked in order to cause the grains to grow into the substrate at least twice, three, or four times the thickness of the molten region. However, Burke does disclose that that "as the boron rich foil melts it wets the base material on either side of the bond and causes some dissolution of the base metal and a wider liquid zone" (Column 6, lines 23-25). Burke also discloses that the "that the bonding temperature should be sufficient to melt the bond foil and a similar thickness of the base material" (Column 6, lines 44-46). Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify the substrates of Burke's transient liquid phase bonding process to cold work the substrate sufficiently to cause the grains to grow into the substrate at least two to four times the thickness of the molten region in order to "produce a fine, well mixed bond zone" (Column 6, line 46).

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Burke et al. (US 6,325,871 B1) as applied to claim 10 above.

Burke discloses that "as the boron rich foil melts it wets the base material on either side of the bond and causes some dissolution of the base metal and a wider

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liquid zone" (Column 6, lines 23-25) and that "simultaneously solid state diffusion causes boron to be removed from the bond pool environs" (Column 6, lines 28-30). Burke discloses carefully controlling the chemistry of the bond medium and temperature of the bonding process to reproduce the chemistry and microstructure of the base material within the bond zone (Column 6, lines 34-38). Also, Burke states that the bonding temperature should be sufficient to melt the bond foil and a similar thickness of the base material "to produce a fine, well mixed bond zone" (Column 6, lines 43-45). Furthermore, Burke utilizes base materials including IN-738 (see column 18, line 2 and tables 1 and 4 for examples of this property). Burke also discloses use of Ni-flex 115 and Ni-flex bonding materials (see column 18, line 20 and table 5 for evidence of this). Burke describes his process for airfoils in turbine blades utilizing the same materials as disclosed by the applicant and therefore it is obvious to arrive at the claimed limitation for joint grains to grow through a full thickness of the substrate (when the substrate is as thin as an airfoil for a turbine blade). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Burke to include the limitation for growth in thin substrates (or airfoils) in order to provide continuous structures across bond regions even in the single crystal structure of a turbine blade airfoil (Burke et al., column 2, lines 54-57).

Response to Arguments

Applicant's arguments filed April 10, 2006 have been fully considered but they are not persuasive.

With respect to claims 1-9 and 12-18, applicant argues that the recitation of both an upper limit of cold working and a lower limit of cold working allows one skilled in the art to understand the scope of the invention for any particular embodiment (page 8). The examiner disagrees and points applicant to the details within the rejection in view of the newly amended claims.

Applicant argues the rejection of claims 10 and 11 are defective because Burke fails to disclose all of the limitations of either claims as originally presented or as amended (page 8). The examiner disagrees, and notes all previous responses regarding applicant's arguments of the features of claims 10 and 11. Furthermore, Applicant argues that claim 10 is directed to cold working performed after the joint has been formed, and the growth of the joint grains is accomplished during a heat treatment conducted separately from the joining process (page 8). The examiner disagrees, and reminds the Applicant that these are not features contained within claim 10, but rather in dependent claim 25. It is also noted (as rejected for claim 25), Burke discloses rapid consumption of the cold worked layer in the presence of the bonding foil by the transient melting process and the resolidification process occurs as single crystal growth from the base material (Column 11, lines 60-63). Also, Burke states, "subsequent melting and solidification reproduces defect free single crystals" (Column 11, lines 65-66).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rachel E. Beveridge whose telephone number is 571-

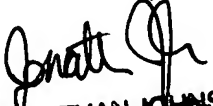
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272-5169. The examiner can normally be reached on Monday through Friday, 9 am to 6 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

reb


JONATHAN JOHNSON
PRIMARY EXAMINER